TECHNICAL MANUAL

GENERAL INSTRUCTIONS

USAF
FUEL, WATER, AND LUBRICANT
DISPENSING EQUIPMENT

(ATOS)

F41608-90-D-1819

F41608-93-D-0526

Prepared By: TRI-COR Industries, Inc.

Published Under Authority of the Secretary of the Air Force

16 AUGUST 2004 **CHANGE 1 - 1 AUGUST 2005**

LIST OF EFFECTIVE PAGES

INSERT LATEST CHANGED PAGES. DESTROY SUPERSEDED PAGES.

NOTE: The portion of the text affected by the changes is indicated by a vertical line in the outer margins of the page. Changes to illustrations are indicated by miniature pointing hands. Changes to wiring diagrams are indicated by shaded areas.

Dates of issue for original and changed pages are:

Original..... 0 ..... 16 August 2004 Change ..... 1 ..... 1 August 2005

TOTAL NUMBER OF PAGES IN THIS MANUAL IS 30, CONSISTING OF THE FOLLOWING:

Page No.	*Change No.	Page No.	*Change No.	Page No.	*Change No.
Title	**1**				
A	**1**				
i - ii	**1**				
iii - iv	0				
1-1	**1**				
1-2 - 1-3	0				
1-4 Blank	0				
2-1 - 2-2	**1**				
3-1	**1**				
3-2 - 3-4	0				
4-1	0				
4-2	**1**				
4-3 - 4-5	0				
4-6 - 4-8	**1**				
4-8.1 Added	**1**				
4-8.2 Blank	**1**				
4-9 - 4-12	0				

*Zero in this column indicates an original page

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

INTRODUCTION

1. PURPOSE.

This manual provides general instructions for the operation and inspection of equipment installed on fuel dispensing equipment. General procedures for truck operations performed at storage facilities are provided. Inquiries and recommended changes to this technical order should be directed to WR-ALC/AFTH, Wright-Patterson AFB, OH 45433.

a. WR-ALC has engineering responsibility for NSC 2320, Truck and Truck Tractors. Technical orders for NSC 2320 take precedence over this technical order.

b. Base Civil Engineering has maintenance responsibility for the truck fillstands, installed fuel hydrant systems, fuel storage tanks, and other real property.

2. SCOPE.

a. General instructions contained in this manual are applicable to fuel and dispensing equipment defined as mobile. Also, to provide maintenance and inspection documentation for certain components of installed systems where operation and maintenance is performed by base fuels personnel.

b. Where provisions of this technical order conflict with provisions contained in fuel and equipment technical manuals, the provisions in this technical order take precedence. Inspection intervals contained in T.O. 36-1-191 take precedence over inspection intervals in this technical order. T.O. 00-25-172 will be complied with during all refueling/defueling operations.

SAFETY SUMMARY

1. WARNING AND CAUTION STATEMENTS.

WARNING and CAUTION statements have been strategically placed throughout this text prior to operating or maintenance procedures, practices, or conditions considered essential to the protection of personnel (WARNING) or equipment and property (CAUTION). A WARNING and CAUTION will apply each time the related step is repeated. Prior to starting any task, the WARNINGs or CAUTIONs included in the text for the task will be reviewed and understood.

2. DEFINITIONS.

The following definitions apply to WARNINGs, CAUTIONs, and NOTEs found throughout this publication.

WARNING

Highlights an operation or maintenance procedure, practice, statement, etc., which, if not strictly observed could result in injury, long-term health hazard, or death to personnel.

CAUTION

Highlights an operation or maintenance procedure, practice, statement, etc., which, if not strictly observed, could result in damage or destruction to equipment or loss of mission effectiveness.

NOTE

Highlights an essential operating or maintenance procedure, condition, or statement.

3. GENERAL PRECAUTIONS.

The following are general safety precautions that are not related to any specific procedures and therefore do not appear elsewhere in this technical manual. These are general safety precautions and instructions that people must understand and apply during many phases of operation and maintenance to ensure personal safety and health and the protection of Air Force property.

4. FINGER RINGS/JEWELRY.

Finger rings have caused many serious injuries. Remove rings, watches, and other metallic objects which may cause shock or burn hazards. Unless specifically allowed by shop safety procedures, remove finger rings during all maintenance activity.

5. COMPRESSED AIR.

Use of compressed air can create an environment of propelled particles. Do not direct air streams towards self or other personnel. Air pressure shall be reduced to less than 30 psig and used with effective chip guarding and personal protective equipment.

6. DANGEROUS PRESSURE.

Care must be taken during testing to ensure that all test connections are proper and tight. All system components must be compatible with pressure applied. Personnel must be protected by a safety shield or located at a distance sufficient to prevent injury.

7. PERSONAL PROTECTIVE EQUIPMENT (PPE).

If unique local conditions make compliance with the protective clothing or other occupational health requirements specified in this manual unnecessary or impractical, obtain an evaluation of the operation from the Bio-Environmental Engineer. The Bio-Environmental Engineer and Base Safety Office will determine the required precautions.

8. CLEANERS/CHEMICALS.

Some cleaners and chemicals have adverse effects on skin, eyes, and the respiratory tract. Observe manufacturers' WARNING labels; Material Safety Data Sheets (MSDS) instructions for proper handling, storage, and disposal; and current safety directives. Use only in authorized areas. Unless otherwise indicated in the text, use as described in this TO should not result in any immediate health concerns. Consult the local Bio-Environmental Engineer and Base Safety Office for specific protection equipment and ventilation requirements.

9. CONFINED SPACE/CRAWLSPACES.

Personnel that work within an aircraft space(s) that: by design has limited openings for entry and exit, has unfavorable natural ventilation, not intended primarily for human occupancy, or contains other recognized safety hazards shall comply with the requirements of AFOSH STD 91-25, CONFINED SPACES. An AF Form 1024, CONFINED SPACES ENTRY PERMIT will be processed with the local Safety, Health, and Fire Prevention offices prior to entering the space.

CHAPTER 1
FUEL SERVICING NOZZLES

1.1 SINGLE POINT REFUELING NOZZLES, SAE-AS-5877.

Refer to Table 4-1 of T.O. 00-25-172 for a list of approved Single Point Refueling (SPR) nozzles and authorized applications.

CAUTION

The 45-degree D-1 nozzle is acceptable for most SPR servicing operations, especially for fuselage servicing. The straight throat D-2 nozzle is only for underwing fuel servicing applications and must not be used otherwise unless deemed mission essential. Inappropriate utilization of the single point nozzles can and has caused undue stress damage to aircraft SPR adaptors, fuel spills, broken nozzles and components, and other safety related problems.

a. Mission essential determination shall be made by the ranking individual on shift in the Fuels Management Office and shall be documented on the control log in the FAS system by the on duty fuels controller. This information will include but not limited to the crew chief's name, the controllers name on duty in the MOCC, and a brief description of why the straight throat D-2 was deemed mission essential.

b. The D-1 nozzle has a 45-degree inlet throat, while the D-2 nozzle has a straight throat. Both nozzles incorporate a 360-degree swivel feature. The SPR nozzles are designed to connect a refueling/defueling unit to an aircraft at a single point receptacle.

c. The refueling supervisor will ensure the refueling nozzle is securely locked to the aircraft by attempting to remove the nozzle with the nozzle crank handle in the open position prior to pressurizing the hose. If the nozzle can be removed from the aircraft with the crank handle open, it will immediately be removed from service.

d. An automatic vacuum breaker valve will be installed on any SPR nozzles that are used on defueling unit hoses or on other fuel servicing vehicle/equipment hoses that are used during defueling. The automatic vacuum breaker valve is used to prevent damage to the hose and aircraft fuel system.

1.2 CLOSED CIRCUIT REFUELING NOZZLE.

a. A special refueling nozzle is available for refueling H-1 helicopters that have been modified to permit Closed Circuit Refueling (CCR). This nozzle, NSN 4930-00-117-4726, is the normal refueling method at the home station of the H-1 helicopters. The capability exists for the CCR nozzle receptacle on the helicopter to swing away. This provision permits routine over-the-wing refueling at locations not equipped with the CCR nozzle.

b. A locally manufactured adapter is required to mate the CCR nozzle to the dry break coupler (see Figure 1-1).

1.3 OVER-THE-WING NOZZLES.

a. Type MD-3, 2-inch female NPT inlet, NSN 4930-01-022-7901.

b. 1½-inch female NPT inlet, NSN 4930-01-293-4472

c. Nozzles may be equipped with nozzle supports installed on the servicing tube. The support is to protect the aircraft skin and be installed and adjusted to protect the bottom of shallow fuel tanks.

d. Over-the-wing nozzles shall be held by personnel at all times while servicing aircraft and not allowed to remain in the tank open port or rest on the aircraft surface without support.

1.4 NOZZLE REPAIR/TESTING.

a. Repair kits and other parts for nozzles should be obtained from the manufacturer's distributor. Using activities are encouraged to procure necessary parts and locally repair the nozzles. Repair instructions and parts breakdown are contained in the end item technical manuals.

b. New or overhauled nozzles shall be operationally pressure checked and flushed prior to being used for aircraft servicing. Defective nozzles will be removed from service and repaired or replaced.

1.5 NOZZLE STATIC BONDING.

Over-the-wing nozzles used for aviation fuel must be equipped with a static bonding cable, NSN 4010-00-575-6234, and plug, NSN 5935-00-572-5174. Cable length may vary according to activity requirements.

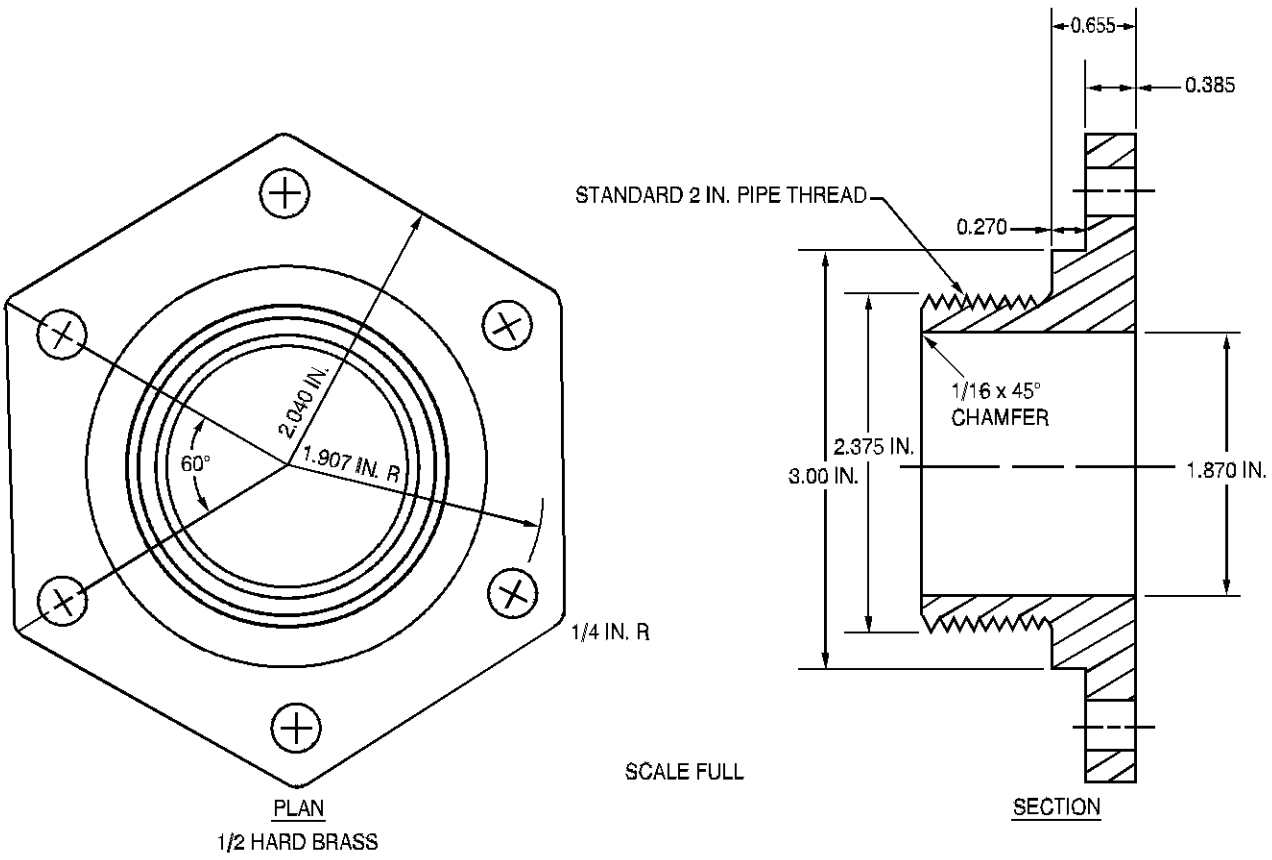
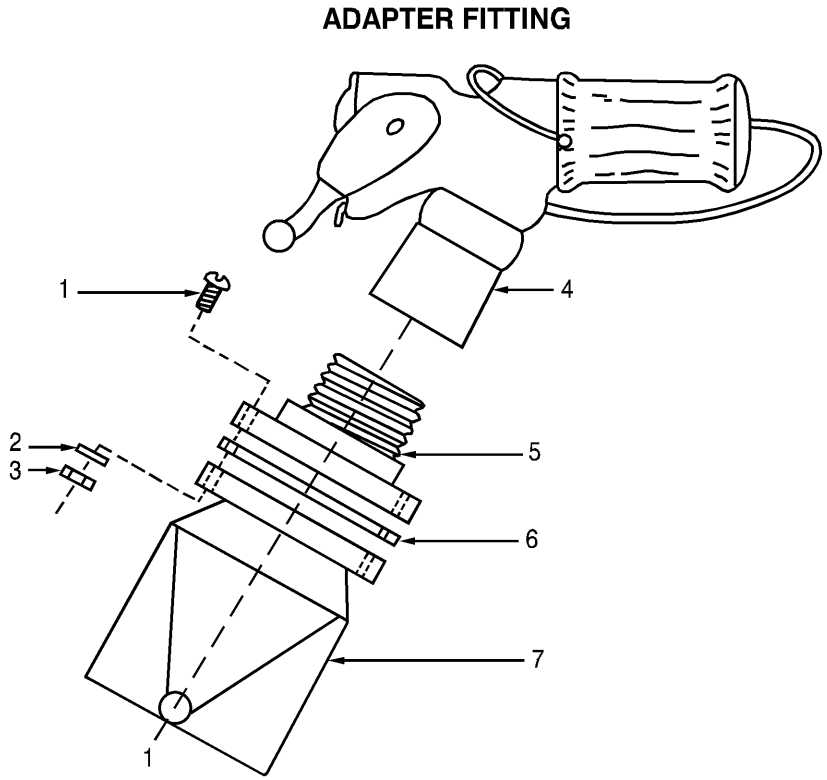


Figure 1-1. Closed Circuit Refueling Equipment (Sheet 1 of 2)



LEGEND

1. Screw (6 ea.)
2. Washer (6 ea.)
3. Nuts (6 ea.)
4. Nozzle (1 ea.)
5. Adapter Fitting (1 ea.)
6. Gasket (1 ea.)
7. Male Coupling (1 ea.)

Figure 1-1. Closed Circuit Refueling Equipment (Sheet 2)

CHAPTER 2
FILTERS AND STRAINERS

2.1 NOZZLE STRAINERS.

All aircraft fuel servicing nozzles, except fillstands used for loading refueling vehicles, must be equipped with a minimum of 40-mesh strainers. Strainers will be removed and inspected on all one time defuels prior to the next fuel issue, monthly and, if necessary, cleaned. During monthly strainer inspections, open the poppet assembly and inspect for proper cotter pin placement.

2.2 LINE STRAINERS.

a. Line strainers installed on fuel servicing trucks and trailers have from 4- to 25-mesh screens, depending upon the type of equipment involved.

b. Line strainers installed on the inlet side of fuel servicing trucks and trailers will have 4- or 8-mesh screens to prevent the collapse of the 100-mesh intermediate screen.

2.3 MICRONIC FILTERS AND FILTER SEPARATORS.

a. Micronic filters are equipped with elements designed to remove solids from fuel. Elements of this type are not effective for complete removal of free water.

b. Filter separators are designed with one or two stages to extract solids and water from fuel during transfer operations. The first stage consists of fiberglass which removes solids and coalesces free water. The second stage cartridges are made with media such as Teflon coated mesh screen, silicone treated pleated paper or synthetic media. This stage permits throughput of fuel but forms a barrier to cause the fallout of water. Water must be drained from filter separators daily when used.

c. When performing daily pre-operational inspection of refueling/defueling and ground product vehicles, preventive maintenance personnel must drain all water from the tank sumps of vehicles inspected.

2.4 FILTER SEPARATOR ELEMENTS.

a. Contact the Air Force Petroleum Office (AFPET) Technical Assistance Team, DSN 785-8070 for the most recent qualified coalescer elements for replacement.

b. Coalescer elements installed in mobile equipment filter separators will be changed in accordance with the following standard criteria (this standard criteria takes precedence over all other published data to include manufacturer's recommendation or vessel data plate):

1. When the adjusted differential pressure reaches 15 psi across the filter separator in accordance with T.O. 42B-1-1
2. When the elements have been in service for 36 months
3. When vessel performance is unsatisfactory or questionable

c. Deleted

d. New elements shall be installed dry after the interior of the vessel has been cleaned as necessary.

WARNING

Static induced ignition of fuel is possible if a filter separator vessel is filled at customary flow rates, resulting in an explosion.

e. After installing new elements, fill the filter separator at the lowest attainable flow rate.

f. Stencil in black paint, letters ¾ or 1 inch high, the next change date (month and year) for the filter element, what type filter elements are installed (part number from the element end cap), and the maximum allowable differential pressure.

2.5 DIFFERENTIAL PRESSURE AND PRESSURE GAUGES.

Solids build-up on filter elements is indicated by a corresponding higher differential pressure reading. Sudden reduction in differential pressure indicates elements may have ruptured.

a. Differential pressure readings will be recorded on the AFTO Form 422 in accordance with T.O. 42B-1-1.

b. Reliability of gauges measuring these pressures is critical. Gauges employed in this type of service shall be calibrated in accordance with T.O. 33K-1-100, except the piston type gauge marketed by Gammon Technical Products, Inc. The Gammon Gauge, Model GTP-534, does not require calibration. However, if there is no differential pressure

imposed on the Gammon Gauge and the piston does not return to zero, either the spring has failed and should be replaced, or the piston is sticking in the glass cylinder.

c. The piston type Differential Pressure (DP) gauge can be equipped with a peak hold feature. This feature will register the maximum DP that is measured during an operation, automatically locking the piston so the operator will have that information without actually having watched the gauge at the time the reading was recorded. After the reading has been seen, the operator releases the piston by turning the knob. Because this is a new feature and will give a more realistic view of the condition of filters in the vehicle, local management will implement procedures for recording the peak DP readings to meet the minimum requirement of T.O. 42B-1-1, Paragraph 3.19, Steps a through g.

2.6 REUSABLE SEPARATOR ELEMENTS (TEFLON SCREENS).

These elements may surround the coalescer elements or may be in a separate section of the vessel. The Teflon elements will be inspected and cleaned each time the coalescer elements are changed.

a. Cleaning Process – after removing separators from the filter/separator vessel, set separator in a bucket of clean fuel and wipe it down with a soft bristle brush or clean rag.

b. Inspecting – hold separators by the end caps and inspect entire screen surface for any nicks or cuts. Any flaws smaller than 1/8 inch may be repaired with a fuel resistant epoxy. Inspect end caps for damage. Each separator should be checked by pouring water (not spraying or allowing the water to fall more than 3 inches) over the entire screen surface. The water should bead and roll off the screen. If the water does not bead, but seeps into the screen, the separator must be cleaned again. Hot water may be used with a soft bristle brush or rag and rinsed with clean fuel and retested. If the screen fails a second time, the separator should be replaced. After separators pass the water test, rinse separators with clean fuel and set aside until ready for reinstallation.

CHAPTER 3
FUELS MOBILE/FUELS MOBILITY SUPPORT EQUIPMENT

3.1 GENERAL.

This chapter provides general operating procedures for filling/emptying refueling units at storage facilities and procedures for lock control systems. Personnel performing transfer operations will be proficiency evaluated and qualified in accordance with AFI 23-201. Safety precautions will be followed in accordance with applicable AFOSH directives.

3.2 FILLSTAND BOTTOM LOADING.

This method is the primary method of filling Air Force refueling equipment.

a. Position the vehicle to prevent stress on components during connection and fuel transfer.

b. Engage the parking brake. Engines on all refueling units will be turned off.

c. Bond the vehicle to the fillstand prior to making any fuel nozzle connection.

d. Connect the fillstand hose/pantograph arm to the bottom loader ensuring the nozzle is securely locked in place.

e. Test the high level shutoff system, if equipped, at the beginning of each filling operation. If the test fails, remove the vehicle from service immediately and notify RFM. Units with a non-operational high level shutoff system will only be used when mission essential at which time a person must be placed on top of the unit upwind to prevent overfilling.

NOTE

Personnel shall not be stationed on top of a refueler if the unit is equipped with an operational high level shutoff system.

f. Upon completion of the operation, disconnect the nozzle and stow the fillstand hose/pantograph arm.

g. Complete accountable documents in accordance with AFMAN 23-110.

h. Perform a safety walk around inspection of the refueler and remove the bonding cable.

3.3 FILLSTAND TOP LOADING.

An approved waiver will be obtained from the parent MAJCOM Fuels and Safety Offices prior to performing top loading. A recognized hazard of top loading is the turbulence, splashing, and spraying of product resulting from too high initial fill rate and downspout not being extended to the bottom of the tank.

a. Position the vehicle to prevent stress on equipment components during fuel transfer.

b. Engage the parking brake and turn off vehicle engine.

c. Bond the unit to the fillstand prior to making any fuel nozzle connection.

d. Extend the downspout to the bottom of the tank to minimize free-falling fuel.

e. Upon completion of operation, wait a minimum of 1 minute before withdrawing the downspout from the fuel. In addition wait a minimum of 30 minutes before inserting objects (i.e., sampling thief, gauge tapes, etc.) into the tank.

f. Complete accountable documents in accordance with AFMAN 23-110.

g. Perform a safety walk around inspection of the refueler and remove the bonding cable.

3.4 RETURNING FUEL TO STORAGE.

This operation is performed the same as an issue to an aircraft.

a. Position the vehicle to prevent stress on equipment components during fuel transfer.

b. Bond the unit to the storage system.

c. Connect the issue hose to the off-loading header.

d. Transfer fuel to the storage system.

e. Upon completion, disconnect and stow the hose.

f. Complete accountable documents in accordance with AFMAN 23-110.

g. Perform a safety walk around inspection and disconnect the bonding cable.

3.5 LOCK CONTROL SYSTEM.

Lock control systems are used to prevent the inadvertent issue of product.

a. Units in aviation service.

(1) Bases which store more than one grade of aviation fuel must have lock control systems on their refuel units.

(2) Defuel units will have a lock control system.

(3) Units on QC hold will be locked.

b. Units not in aviation service will be locked in a manner determined by the Fuels Flight Commander.

c. All vehicles/trailers containing reclaimed or recoverable fuel will be locked.

3.6 FUEL DISPENSING/TRANSFER EQUIPMENT (AS REFLECTED IN AS 154).

All fuel servicing systems will be maintained in a complete serviceable condition by accomplishing the required calibrations, inspections, and tests on components and systems. Wetted filter elements in WRM-stored FMSE must be replaced after 36 months if equipment hasn't been used for fuel servicing after elements were initially wetted. Unused (dry) filter elements installed in a filter separator vessel must be replaced after 60 months. It is permissible to store filter separator vessels without elements installed as long as the filter elements are adequately boxed, maintained with the dispensing system, and the filter separator vessel is clearly identified as NO FILTER ELEMENTS INSTALLED. In addition, the records must reflect the necessity to install the filter elements prior to deployment or dispensing fuel from the system. The system may be periodically pressure checked without filter elements installed.

3.7 COLLAPSIBLE FABRIC FUEL TANKS.

Fabric coated fuel storage tanks, hereafter referred to as bladders, have specific shelf and use life requirements. The use and shelf life are dictated by bladder composition, construction, and known field experience. Use life is the period of time a fuel bladder is required to store product. Use life begins when product is placed in the fuel bladder. Shelf life is the length of time a fuel bladder can remain in storage and preserve its structural integrity. The bladder shelf and use life may be extended by fuels management provided they meet the inspection criteria outlined in Paragraph 3.9 herein and T.O. 37A12-15-1, Collapsible Coated Fabric Fuel Tanks. All inspections, maintenance, and operational actions including the use life start date and any periods of extension will be annotated on the AFTO Form 95, Significant Historical Data. T.O. 00-20-5, Aerospace Vehicle/Equipment Inspection and Documentation prescribes the use of this form. Modification of the form is authorized for recording actions.

a. Non-ABFDS Fuel Bladders (10,000, 50,000, and 210,000 gal) – the shelf life is 12 years from the date of manufacture when stored in depot-like conditions. These conditions are further defined as dry storage, maintained in the original shipping container and capable of protecting the equipment when exposed to storage temperature ranges of –28° to 160°F (–33° to 71°C). When the bladder is stored outside of its original shipping container, i.e., stored at a deployed location as a spare, the shelf life is 5 years from the date of receipt or 12 years from the date of manufacture whichever comes first. The use life is 3 years from the date fuel is placed into the bladder.

b. 3,000-gallon ABFDS Fuel Bladders – the ABFDS is a 3,000-gallon bladder with a use life of 10 years from the date of manufacture. These bladders, because of their composition, are approved for operational storage beyond their use life limit. Bladders will be placed in storage when not in use.

3.8 STORAGE.

Store bladders so they are protected from direct sunlight and moisture. Do not remove non-ABFDS bladders from packing crates. Store crates in a manner that will ensure their protection and deployment access. ABFDS bladders will be uncrated, unrolled, and placed flat on an airdrop platform designated for 463L cargo aircraft rail systems. Ensure objects other than those approved as bladder accessories are not placed on top of bladders.

3.9 INSPECTION.

Proper inspection and serviceability checks are required to ensure bladder integrity. Submit Quality Deficiency Report (QDR)/Material Deficiency Report (MDR) in accordance with Paragraph 3.10 for any bladder damage or defects.

a. Initial Receipt – visually inspect fuel bladders received for packing and transportation damage. With the exception of ABFDS bladders, inspect only the external portion of the bladder. Do not remove the bladder from the airtight plastic bag. Reseal damaged plastic bags with tape. Three thousand gallon ABFDS bladders will be inspected during initial receipt as outlined in 3.9, Step b.

b. Annually and Prior to Use – inspect all ABFDS and a single non-ABFDS bladder from each contract and lot number annually. Document the inspection on AFTO Form 95. If no damage is found, return bladder to storage or use as required. If defects are noted in the manufacturer's representative sample, examine two additional bladders

from the same contract and lot number. Inspect all bladders prior to use. Bladders will be inspected for the following:

(1) Seam Separation – inspect all seams as bladders are unrolled. Seams showing separation shall be identified, repaired if possible, and reported.

(2) Dry Rot.

(3) Cracking.

(4) Splitting.

(5) Excessive Chaffing.

(6) Gummy Spots – soft spots or blisters on the outer liner signifying bladder material separation.

(7) ABFDS Bladder Leak Tests – prepare the bladder for filling and install the air eliminator without an anti-siphon valve connected. Fill the bladder with 2,300 gallons of metered fuel. Cinch the cargo straps as tight as possible and continue to fill until the pressure gauge reaches 1.5 psig. Hold the bladder pressure static for a minimum of 24 hours and closely monitor for signs of weeps, seeps, and leaks. MAJCOMs may waive the 24-hour time limit as mission dictates. Next, simulate bladder sloshing by vigorously pushing on the bladder and observing the air eliminator for fuel leaks. If no leaks are observed, annotate the test date on DD Form 1574, Serviceability Tag-Material and attach to the air eliminator. If leaks are observed, place a DD Form 1577-2, Unserviceable Tag-Material on the air eliminator and rebuild/replace the air eliminator. Stencil the rebuild date on the side of the air eliminator. Retest the air eliminator for proper operation. When the leak test is complete, drain as much residual fuel from the bladder as possible, using a sandpiper diaphragm pump, NSN 4320-01-158-7227.

3.10 QUALITY DEFICIENCY REPORT/MATERIAL DEFICIENCY REPORT SUBMITTAL.

A deficiency report will be submitted when defects have been noted during a bladder's designated shelf or use life. Using Table 3-2, submit reports in accordance with T.O. 00-35D-54, USAF Deficiency Reporting and Investigating System, with an information copy forwarded to DET 3, WR-ALC/AFL, 8725 John J. Kingman Road, Stop 6232, Fort Belvoir, VA 22060-6232, E-mail: afpet@afpet.dla.mil.

a. Classify bladder deficiencies in accordance with Table 3-2 and submit a QDR/MDR when one of the following occurs:

- Significant deficiency has been identified during an inspection
- Anytime a bladder is within its use life and develops multiple Class IIs and a Class III or IV

b. Subsequent reports are not required for the same bladder unless new deficiencies occur in an area not previously reported.

c. Retain subject bladders, if they are in storage status, until disposition instructions are received. For those in operational use, discard in accordance with local procedures, while retaining the identification markings for the bladder (manufacturer, contract number, lot number, etc.).

Table 3-1. Bladder Life Cycle

Shelf Life			
Bladder	**Depot-Like**	**Field**	**Use Life**
3,000-gallon (ABFDS)	See Use Life [1]	See Use Life [1]	10 Years
10,000-gallon	12 Years	5 Years	3 Years
50,000-gallon (manufactured before: July 2002)	10 Years	10 Years	1 Year
50,000-gallon	12 Years	5 Years	3 Years
210,000-gallon	12 Years	5 Years	3 Years

[1] Storage and use life are 10 years from the manufacture date since an initial and annual inspections require fuel to be introduced into the bladder.

Table 3-2. Classes of Fuel Bladder Leaks for Reporting Purposes

Category	Description	Action
CLASS I	Weeping or seeping of fuel causing a damp spot or discoloration of the fabric not large enough for drops to form.	a. Repair weeps or seeps. b. Document AFTO Form 95.
CLASS II	Seeping which causes a wet spot on the fabric. It may also cause drips to form but not at a steady rate.	a. Repair seeps. b. Document AFTO Form 95. c. Submit a QDR/MDR for multiple seeps.
CLASS III	Leaking caused by punctures, tears, holes, abrasions, or fittings that result in a steady drip or small stream, which cause fuel to puddle.	a. Repair leaks. b. Document AFTO Form 95. c. Submit a QDR/MDR if leak occurs because of a material deficiency.
CLASS IV	Any defect that causes severe loss of product including catastrophic failures.	a. Document AFTO Form 95. b. Submit a QDR/MDR.

CHAPTER 4
INSPECTION, TESTING, AND MAINTENANCE

4.1 DEFINITIONS, INTENDED USES AND STORAGE OF HOSES.

The data in Table 4-1 is a guide for use by field activities.

a. The following definitions apply to the words used in Table 4-1:

Soft	A hose evacuated to a collapsed position for easy storage
Semi-Hard	A non-reinforced hose that is pliable but is not required to collapse for storage
Hard	A wire or cord helix reinforced hose

b. Only hose conforming to Military Specifications MIL-DTL-6615, MIL-DTL-26521, MIL-DTL-26894, MIL-PRF-370, MIL-DTL-27516, and American Petroleum Institute (API) Bulletin 1529 shall be used on fuel servicing equipment (see Table 4-1).

c. Only API Bulletin 1529, Grade 2 (300 psi WP), Type C hose will be used for hot refueling, hot/rapid defueling and hot Integrated Combat Turnaround (ICT) operations.

d. Hose conforming to Specification MIL-DTL-27516 and MIL-PRF-370, Types I and II, shall be used only for suction and low-pressure dispensing applications. The MIL-PRF-370, Type C, collapsible hose, can be used for high-pressure discharge transfer lines (refer to Table 4-1).

e. Temperature, humidity, ozone, sunlight, oils, solvents, corrosive liquids and fumes, insects, rodents, and radioactive materials can affect hose products. The appropriate method for storing hose depends on its size (diameter and length), the quantity to be stored, and the way it is packaged. Hoses should not be piled or stacked to such an extent that the weight of the stack creates distortions on the lengths stored at the bottom. Whenever feasible, rubber hose products should be stored in their original shipping containers. Hose, shipped in coils or bales, should be stored so that the coils are in a horizontal plane. Storage areas should be relatively cool and dark, free of dampness and mildew. Items should be stored on a first-in, first-out basis, since an unusually long shelf life could deteriorate certain rubber products. Exposure to direct or reflected sunlight, even through windows, should be avoided. Uncovered hose should not be stored under fluorescent or mercury lamps, which generate light waves harmful to rubber.

f. Hose shelf/storage life varies with storage location, climatic conditions, hose storage conditions, and the specific type of hose. For example, the MIL-PRF-370, Type C, if properly stored (inside and sheltered from damaging ultraviolet) can have a shelf life of 5 years from the date of manufacture. Accordingly, the storage period for API 1529 hose should not exceed 2 years from the date of manufacture. Shelf life for all hoses is dramatically reduced if they are stored outdoors in the direct sunlight at hot, humid locations. Contact the hose manufacturer for specifics when there are questions concerning hose shelf life and storage conditions.

g. All hoses in storage or in service shall have a maximum hose life of 15 years from the manufactured date.

h. Hoses stored in warehouse conditions that have exceeded their shelf life should be inspected annually.

(1) Hoses that have been removed from their original packing should be stored as close to requirements outlined in Paragraph 4.1, Step e, so no damage can be sustained to the hose (i.e., no kinks, end caps in place, flat coils, no direct sunlight).

(2) If hoses are installed on equipment in WRM/FMSE inventory, an inspection should be accomplished during the operation inspection of the equipment. This inspection should include, but not limited to, extending the hose completely and visually inspecting for cuts, kinks, bubbles, and slippage of couplers.

i. Any hose that has exceeded its shelf life shall be hydrostatically tested according to Paragraph 4.5 of this TO prior to putting the hose into service.

Table 4-1. Refueling Hose

Type	Specification	End Item Application	Purpose	Hydrostatic Test Frequency	Hose ID Inches	Pressure	
						Proof	Burst
SOFT	MIL-DTL-26521	Hose Reel R-9 and Hydrant Hose Carts	Discharge	Prior to Installation	2 – 3 4	400 340	900 900
SEMI-HARD	MIL-DTL-6615	Over-the-Wing Hose Reels and Hose Carts	Discharge and Suction	Prior to Installation	1¼ 1½ 2 2½ 3 4	300 300 275 275 250 250	800 800 700 700 600 500
SEMI-HARD HARD	MIL-PRF-370 Type I Type II	R-14/R-22 Air Transportable System	Suction and Discharge	Prior to Installation	1 – 1½ 2 2½ 3 – 6	250 225 225 150	500 400 375 300
COLLAPSIBLE	MIL-PRF-370 TYPE C	R-14/R-22 Air Transportable System	Discharge	Certified or Prior to Installation	6	400	600
HARD	MIL-DTL-27516	PMU-27 and ABFDS	Suction and Low-Pressure Discharge	Prior to Installation	1 – 1½ 2 – 3 4 – 6	175 175 100	500 400 300
HARD	MIL-DTL-26894	Hose Carts and Hydrant Servicing Vehicles	Inlet Hose	Prior to Installation	All	350	700
SEMI-HARD	API 1529 Grade 2 (300 psi WP)	Support Equipment R-11 and Hydrant Servicing Vehicles	Defuel and Refuel	Certified or Prior to Installation	2 – 4	600	1200
SEMI-HARD	API 1529 Grade 2 (300 psi WP)	Support Equipment R-11, R-14, and Hydrant Servicing Vehicles	Hot Refuel, Hot/Rapid Defuel, and Hot ICT	Certified or Prior to Installation Retest Annually	2 – 4	600	1200
COLLAPSIBLE	P/N AE706722-2	Forward Area Manifold (FAM) Cart	FARP	Prior to Initial Use Retest Semi-Annually	2	150	300

4.2 AIRCRAFT REFUELING HOSE, API BULLETIN 1529 COUPLER PROCEDURES.

API 1529, Grade 2 (300 psi WP) refueling hose will be recoupled using couplers designed for use on aircraft fueling hose. The coupler will incorporate the features and specifications by design as depicted by the two-piece internally expanded coupler (see Figure 4-1). Couplers shall meet the requirement of API 1529, Fifth Edition, May 1998, Section 7, Paragraphs 7.1.1, 7.1.2, and 7.1.3 unless otherwise specified by the purchaser. When a hose in service is to be fitted with a new coupling, the following should be observed:

WARNING

Accuracy of hose measurement is critical to proper ferrule selection and security of the hose end coupler. Improper ferrule selection could result in coupler/hose separation causing a fuel spill and fire hazard.

CAUTION

When assembling hoses to couplers, do not alter the outer surface of the hose. Shaving the outer surface or covering to allow easy fit of the ferrule will weaken the connection and allow the hose to separate from the coupler when pressure is applied.

NOTE

Brass ferrules manufactured by Couple-Up Inc. will not be installed on API 1529 hose. Brass ferrules by Couple-Up Inc. have a history of stress cracking or splitting as much as 2 years after installation and hydrostatic testing. Stainless steel (300 series) ferrules manufactured by Couple-Up are acceptable.

a. Recoupling must be done by a hose manufacturer, distributor, or user having a formal written procedure and a training program on recoupling.

b. The hose assembly must be indelibly marked or fitted with a durable label, or the coupling itself punched to show the coupler's name and location, and the date of recoupling.

c. The recoupling hose assembly must satisfy hydrostatic testing requirements with Paragraph 4.5 before being returned to service.

4.3 FIELD REPAIR PROCEDURES FOR MIL-PRF-370, TYPE C, 6-INCH HOSE.

a. The purpose of these procedures is to provide field instructions for the repair of MIL-PRF-370, Type C, 6-inch collapsible hose (see Table 4-1), using repair kit, NSN 4730-01-389-7706. Refer to Figure 4-3 for kit description.

WARNING

The following repair procedures must be performed in a well-ventilated area and the proper PPE must be worn. Fuel products can cause injury to the skin, eyes, and the respiratory tract.

b. In preparation to repair the MIL-PRF-370, Type C, 6-inch collapsible hose, inspect area of hose that has been damaged and determine if hole is ¼ inch wide or greater. If damage is larger than ¼ inch, go to Paragraph 4.3, Step c, for repair instructions. Verify all required items in this procedure are available before making initial cut into the hose for repair. Perform the following steps for hose damage less than ¼ inch wide.

(1) Remove pressure from the hose. Drain hose or clamp hose shut about 3 feet on either side of leak.

(2) Using a hose knife, cut the hose in two through the damaged area. The ends of the hose should be square within ¼ of an inch. Remove 1 inch of just the urethane part (from each end) of the hose that was cut. This should expose 1 inch of the imbedded ground wire(s) around the hose diameter. The ends of the exposed ground wire(s) should be square within ¼ of an inch.

(3) Using a hex key, set gaps between J-clamp segments to approximately ¼ inch. See Figure 4-3.

(4) Pre-position the J-clamp segments on both sides of hose tube approximately 1 foot from the cut end of the hose.

CAUTION

Verify there is approximate 1 inch of ground wire(s) exposed on each end of the hose cut. This is required to ensure contact with the J-connector for grounding safety of the hose. Damage to equipment may occur without a properly grounded hose.

(5) On one end of the hose that was cut, fold the ground wire(s) inside. Insert the J-connector into the hose. The hose should cover all of the barbs on that end of the connector. The ground wire(s) should be between the hose and the barbs of the J-connector (refer to Figure 4-3).

(6) Position the J-clamp approximately ½ inch from the end of the hose, square to the hose axis. Using a hex key, completely close the gap on two screw segments of the clamp.

(7) On the other side of the cut hose, slip the hose over the open end of the J-connector ensuring all of the barbs are covered on the connector. The ground wire(s) should be between the hose and the barbs of the J-connector.

(8) Position J-clamp approximately ½ inch from the end of the hose, square to the hose axis. Using a hex key, completely close the gap on two screw segments of the clamp.

(9) If a torque wrench is available, tighten the LAST screw segment of both clamps on either side of the J-connector to 50 foot-pounds of torque (gap should be ¼ inch or less). If no torque wrench is available, tighten the LAST screw segment of both clamps on either side of the J-connector so the last gap between the J-clamp segment is approximately ¼ inch or less.

(10) Verify continuity of hose ground wire(s) through repaired hose length. If hose fails continuity check, remove J-clamps and repeat Steps (5) – (9) until ground continuity is achieved.

(11) Hydrostatically test the repaired hose following Paragraph 4.5 in the TO. If the hydrostatic testing equipment is not available, and the hose is to be put into service immediately following the repair, perform Steps (12) and (13).

(12) If clamps were used to shut off fuel to the damaged area of the hose, remove clamps, fill and pressurize the hose. If the hose was drained, reconnect hose to pump and pressurize hose. Monitor the hose repair for 30 minutes during flow and observe gap between hose ends for slippage.

(13) Perform leak check on repaired hose. If repair fails check, repeat procedure steps as required until leak is no longer noted.

c. If damage is larger than ¼ inch on MIL-PRF-370, Type C, 6-inch collapsible hose, the removal of at least 1 foot of the damaged section will be required. A replacement length equal to the removed section of hose and a second repair kit will be required. Verify all required items are available before making initial cut into the hose for repair. Perform the following steps for hose damage more than ¼ inch wide.

(1) Remove pressure from the hose. Drain hose or clamp hose shut about 3 feet on either side of the section (1 foot minimum or greater) of hose to be removed.

(2) Using a hose knife, cut the hose in two on either side of the damaged area making sure to remove at least 12 inches of hose. This will ensure enough room for the replacement section of hose to be clamped over J-connectors and that the connectors are not jammed into each other causing possible leaks.

(3) The ends of the hose should be square within ¼ of an inch. Remove 1 inch of just the urethane part of the hose from each end of the hose that was cut and the replacement section of hose. This should expose 1 inch of the imbedded ground wire(s) around the hose diameter. The ends of the exposed ground wire(s) should be square within ¼ of an inch.

(4) Using a hex key, set gaps between J-clamp segments to approximately ¼ inch. See Figure 4-3.

(5) Pre-position the J-clamp segments on both sides of the hose tube approximately 1 foot from the cut ends of the original hose. Pre-position J-clamp segments as far back as necessary on the replacement section of hose making sure to not interfere with installation of the J-connectors.

CAUTION

Verify there is approximately 1 inch of ground wire(s) exposed on each end of the hoses. This is required to ensure contact with the J-connector for grounding safety of the hose. Damage to equipment may occur without a properly grounded hose.

(6) On one end of the hose that was cut, fold the ground wire(s) inside. Insert the J-connector into the hose. The hose should cover all of the barbs on that end of the connector. The ground wire(s) should be between the hose and the barbs of the J-connector (refer to Figure 4-3).

(7) Position the J-clamp approximately ½ inch from the end of the hose, square to the hose axis. Using a hex key, completely close the gap on two screw segments of the clamp.

(8) Bring the replacement hose with ground wire(s) folded inside, over to the connector. Slip the

hose over the open end of the J-connector ensuring all of the barbs are covered on the connector. The ground wire(s) should be between the hose and the barbs of the J-connector.

(9) Position the J-clamp approximately ½ inch from the end of the hose, square to the hose axis. Using a hex key, completely close the gap on two screw segments of the clamp.

(10) Repeat Steps (6) thru (9) for the second J-connector and other end of the replacement hose.

(11) If a torque wrench is available, tighten the LAST screw segment of all clamps on either side of both J-connectors to 50 foot-pounds of torque (gap should be ¼ inch or less). If no torque wrench is available, tighten the LAST screw segment of both clamps on either side of the J-connector so the last gap between the J-clamp segments is approximately ¼ inch or less.

(12) Verify continuity of hose ground wire(s) through repaired hose length. If hose fails continuity check, remove J-clamps and repeat Steps (5) – (11) until ground continuity is achieved.

(13) Hydrostatically test the repaired hose following Paragraph 4.5 in this TO. If the equipment required to perform hydrostatic testing is not available, and the hose is to be put into service immediately following the repair, perform Steps (14) and (15).

(14) If clamps were used to shut off fuel to the damaged area of the hose, remove clamps, fill and pressurize the hose. If the hose was drained, reconnect hose to the pump and pressurize hose. Monitor the hose repair for 30 minutes during flow and observe gap between hose ends for slippage.

(15) Preform leak check on repaired hose. If repair fails leak check, repeat procedure steps as required until leak is no longer noted.

4.4 LOCAL FABRICATION OF REFUELING HOSE ASSEMBLIES USING SAE AS38404 COUPLERS.

SAE AS38404 couplers (see Figure 4-1) are authorized as an alternate coupler for all MIL-DTL-6615 and MIL-DTL-27516 hoses. In addition, MIL-DTL-26521 hose produced prior to the G revision of the specification may be coupled with the SAE AS38404 coupler. For Air Force purposes, the SAE AS38404 coupler is a one time use coupler. Only qualified personnel will install hose end couplers.

a. Assembly Procedure.

(1) Determine hose length and cut squarely.

(2) Select the desired coupler. Place hexagon part of coupler body (nipple) in vise with the ridged end outward.

(3) Slip the sleeve (socket) over the hose end, approximately 8 inches.

(4) Slip the grip (compression spring) over the hose end, approximately 6 inches. If the spring does not fit snugly on the hose, replace the entire coupler assembly.

(5) Push hose over the nipple until it bottoms against the nipple chamber.

(6) Work the compression spring until it butts against the threaded forward shank of body assembly.

CAUTION

When assembling hoses to couplers, do not alter the outer surface of the hose. Shaving the outer surface or covering to allow easy fit of the fitting over the compression spring will weaken the connection and allow the hose to separate from the coupler when pressure is applied.

NOTE

The sleeve should not bottom out against the coupler flange. Zero clearance (gap) requires a check of the coupler to hose fit.

(7) Remove the sleeve and check the compression spring alignment. Work sleeve forward and engage threads by hand. Using a spanner wrench or equivalent tool on sleeve, screw threaded compression sleeve to a gap of 0.030 inch nominal (gap not to exceed 0.045 inches). This gap should be obtained only when local fabrication of hose is required.

(8) Paint a 2-inch white band around the hose at the compression sleeve to serve as a slippage indicator.

b. Pressure test the hose assembly as described in Paragraph 4.5.

4.5 HYDROSTATIC TEST.

The following testing procedures apply to all fuel dispensing hose conforming to Military Specifications and API Bulletin 1529. Only qualified personnel will perform hydrostatic tests.

WARNING

Failure to comply with the following procedures could result in personal injury or loss of life.

a. Place both hose end couplers inside of restraining cages. The cages may be locally fabricated by welding 3/8 inch rebar or similar material capable of securing the hose in place and containing the hose end couplers in event of coupler separation from the hose during hydrostatic testing. Cages must be structurally capable of sustaining minor damage without affecting safe reuse at pressure in excess of 600 psi.

b. Hose will be placed in a straight position with the hose end couplers caged during hydrostatic testing.

c. Test assembly will consist of hose and hose end couplers. Connect the hose to a pump equipped with pressure bypass capable of producing constant pressure supply, such as hydrostatic hose tester, NSN 4940-00-546-2551 (or equivalent). The opposite end of the hose shall be fitted with a pressure tight cap having a valve or means of bleeding air. Elevate the capped end to preclude air entrapment. Hose will be marked by painting a 2-inch white band completely around the hose adjacent to the coupler ferrule to enable detection of any coupler slippage during hydrostatic testing.

d. Using water as the test fluid, fill the hose through the pump with the bleed vent open to displace the air within the hose.

e. After displacing the air, close the bleed vent. Raise the test pressure to the proof pressure of the hose and hold for 2 minutes (see Table 4-1). Examine the hose and coupler for slippage, leakage, distortion, bulges, or defects. Reduce the applied pressure to zero.

f. Increase the pressure to 25% of the proof pressure and hold for 2 minutes. Examine the hose and couplers for slippage, leakage, distortion, bulges, or defects. Reduce the applied pressure to zero.

g. Increase the pressure to the proof pressure of the hose and hold for 2 minutes. Examine the hose and couplers for slippage, leakage, distortion, bulges, defects, or slippage. Reduce the applied pressure to zero.

h. After hydrostatic testing, the hose inner tube and coupler tail will be internally inspected using an inspection mirror and flashlight. Any evidence of cuts, bubbles, blisters, or cracks in the tube or coupler tail shall be cause for removal of the assembly from service.

i. Failure Criteria – no leakage, bulges, defects, distortion, or slippage at the coupler of more than one sixteenth of an inch is permitted on a hose assembly during hydrostatic testing, or in service use. Minor nicks, cuts, scuffs, and cracking on the outer cover are acceptable, however, any condition resulting in the separation or cutting of any portion of the fabric cord will be unacceptable.

WARNING

Flushing the over-the-wing hose by free-falling fuel through the manhole creates static which could result in static ignition, fire, and possible personnel injury.

j. Drain all residual test fluid (water) from the hose after testing. Flush hose following installation on vehicle/equipment by circulating 100 gallons of fuel through the hose. Over-the-wing nozzles will be fitted with a converter and adapter so fuel can be rotated through the unit's bottom loader. Remove and inspect the nozzle screen for debris prior to returning vehicle/equipment to service.

k. Following installation of a new discharge hose on vehicles/equipment, notify the Resource Control Center (RCC).

4.6 HYDROSTATIC TEST FREQUENCIES.

a. Prior to initial use, all hoses will be identified as being hydrostatic tested by one of the following procedures:

- Certified by a hose distributor with a Certificate of Conformance
- A durable identification label affixed to the hose with proper information as prescribed by appropriate specification
- Be hydrostatic tested to the proof pressure of the hose by local means and date stenciled on the hose

b. Hoses used for hot refueling, hot ICT and hot/rapid defueling operations must be retested annually and the testing or certification date stenciled on the hose within 4 feet of the outlet coupler for visual reference.

NOTE

- Refueling equipment used to hot refuel the E-4B aircraft is exempt from the annual retest.
- Hose installed on equipment handling demineralized water is exempt from hydrostatic testing.

c. Hose will be inspected and hydrostatic tested after cutting the hose and replacement of hose end couplers or anytime the reliability of the hose or coupler is questionable.

4.7 SOAKING AND FLUSHING PROCEDURES.

WARNING

Flushing the over-the-wing hose by free-falling fuel through the manhole creates static which could result in static ignition, fire, and possible personnel injury.

After new dispensing hoses are installed they will be soaked, flushed, and sampled in accordance with T.O. 42B-1-1. If new hose fails hydrostatic testing or fuels sampling, hose will be removed and a Quality Deficiency Report will be submitted in accordance with T.O. 00-35D-54. To prevent free-fall of fuel during over-the-wing nozzle flushing, use one of the following methods.

a. Local Manufacture Converter Drawing and Instructions.

NOTE

The local manufacture converter is the only authorized converter to recirculate fuel through the bottom loader during over-the-wing hose flushing/sampling operation.

(1) Local manufacture a flange with dimensions given in Figure 4-2.

(2) Obtain an over-the-wing nozzle tube (spout). Insert the unthreaded end of tube flush with opposite side of local manufactured flange.

(3) Aluminum weld tube to flange on tube inserted side.

(4) Bolt local manufactured converter to single point nozzle flange.

(5) Install screen in local manufactured converter tube and screw onto the over-the-wing nozzle spout.

b. Optional Flushing Procedures.

(1) Clamp hose approximately 8-foot long to the over-the-wing nozzle spout.

(2) Bond the over-the-wing nozzle to bare metal in the vicinity of the manhole prior to opening the manhole.

(3) Avoid free-fall and spray of fuel by extending the hose to the bottom of the cargo tank.

(4) Operate at low flow to minimize electrostatic generation and enhance relaxation while flushing 500 gallons of fuel through hose.

4.8 STRAINERS, NOZZLES, AND HOSES.

a. Fuel dispensing nozzles shall be functionally tested by applying pump pressure against the closed nozzle. This test will be accomplished at the daily vehicle checkpoint, or during the first servicing operation of the day. Hose cart nozzles shall be tested prior to or during the first servicing operation of the day. All nozzles will be inspected at the daily check point or prior to the first operation of the day for the following:

(1) Physical damage, scrapes or gouges that could cause leakage.

(2) Missing or bent parts at the nozzle to plane/hydrant connection.

(3) Inspect all handles and guard bars.

(4) Inspect the collar for cracks or severe dents.

(5) The operating lever should be free of binding during the full movement.

b. Nozzles that fail to shut OFF or are found to leak in the CLOSED position shall be repaired or removed from service.

c. All line strainers on fuel, water trucks/trailers, and carts will be cleaned at scheduled inspection nearest 12 months or 360 days (T.O. 36-1-191), or more often if flow becomes restricted. Nozzle strainers will be inspected every 30 days and cleaned as necessary. During monthly strainer inspections, open the poppet assembly and inspect for proper cotter pin placement.

d. If inspection reveals a screen is punctured or damaged and is beyond economical repair or if proper fit is not possible, the screen will be replaced.

e. Under no condition will fuel be transferred directly into aircraft tanks from a permanently installed dispensing system or servicing units which are not properly equipped with the required strainers.

f. Prior to or during the first servicing operation of the day, discharge hoses will be fully extended, pressurized, and carefully examined for any indication of external damage, excessive wear, soft spots, slippage at couplers, or bulges. Special attention shall be directed to the area immediately adjacent to the couplings for indications of structural weakness or coupling damage.

g. Prior to or during the first servicing operation of the day, inspect Quick-Disconnects (QD) for the following:

1. QD's equipped with locking pins to prevent the tabs from being depressed will be in place

2. Locking rings will be in the lock position

3. Bumpers will be in good condition without pieces/chunks missing

4.9 WATER SLUG VALVES AND AUTOMATIC WATER DRAIN VALVES.

a. Automatic water drain valves will be removed, plugged, or made inoperative.

b. Water slug valves will be operationally tested monthly and documented during checkpoint inspections. This test will ensure the last line of defense to prevent water from entering the aircraft is operating properly.

c. Water slug valves and mechanical segregators/water lock valves shall be disassembled, cleaned, and functionally checked when filter elements are changed.

4.10 ADJUSTING PRESSURE REGULATORS.

a. Single point refueling shall be accomplished at not more than 50 ± 5 psig at the refueling nozzle. Fuel servicing units shall be checked each 6 months for excessive pressures. This check shall be accomplished using a pressure gauge installed in the nozzle.

b. Pressure-relief or poppet safety valve shall be functionally checked for proper operation once each year. The valve should be adjusted to open at pressures specified in applicable technical manuals using compressed air.

4.11 METER CALIBRATION.

a. Activities not possessing a master meter may use a prover tank as an alternate method. Calibration limits are ±½ gallon for each 100 gallons dispensed.

b. Requirements.

(1) Calibration of meters will be accomplished annually by using a calibrated and certified master meter.

(2) Meter calibration will be accomplished under normal operating pressures and at flow rates prescribed in the applicable technical directive for the end item of equipment.

(3) Liquid used to test and calibrate meters should be near the same temperature of the liquid to be measured.

(4) Meters should be calibrated any time their accuracy is doubtful.

4.12 INSPECTION DATA RECORDS.

Inspection data prescribed by this technical order shall be properly documented in the vehicle historical record and maintained using the applicable AF Form 1829 or AF Form 1830.

1. Meter Calibration
2. Water Slug Valves
3. Filters Replaced
4. Line and Basket Strainers
5. Differential Gauge Calibration
6. Hose Hydrostatic Test Date, Contract Number, and Hose Specification
7. Pressure Regulator Check
8. Pressure-relief or Pop-off Valve
9. Pump and Nozzle Pressure Gauges Calibrations

4.13 FILTER SEPARATOR DIFFERENTIAL PRESSURE LOG (AFTO FORM 422).

Filter separator differential pressure log shall be maintained on all mobile and fixed fuel filter vessels. Differential pressure will be recorded in accordance with T.O. 42B-1-1.

a. AFTO Form 422 entries.

(1) Equipment Identification: enter type and other identification of filter separator.

(2) Date: enter calendar date.

(3) Observed GPM: enter the observed or estimated GPM flow that corresponds to the observed DP.

(4) Observed DP: enter the observed differential pressure.

(5) Adjusted DP: enter the adjusted differential pressure in accordance with T.O. 42B-1-1.

b. The AFTO Form 422 has no historical value other than to provide the operator of the equipment/system with a recent history of performance. This form should be replaced when necessary. When replacing the form, carry forward the last four readings to provide a brief history of the DP. Retention of the form is not required, therefore, the form may be laminated for reuse.

4.14 SINGLE POINT REFUELING (SPR) ADAPTORS.

a. SPR adaptors are used for but not limited to the following:

1. Affixed to A/C for refueling/defueling purposes

2. Fixed fuel transfer stands for delivery or circulation

3. Refueling vehicles as bottom loading points

4. Refueling hydrant vehicles used to secure nozzle stowage

b. Wear limits allowed on certain features of SPR adaptors are crucial for safe interfacing of SPR nozzles and caps. Use of adaptors that exceed the maximum amount of wear (wear limits) may contribute to an unsafe condition. Features of concern but not limited to are the inner sealing surface, three lugs that protrude from the outside diameter of the outboard end of the adaptor and the three square slots in the outboard face. Wear of these features are a function of time and the number of connection cycles to which the adaptor is subjected.

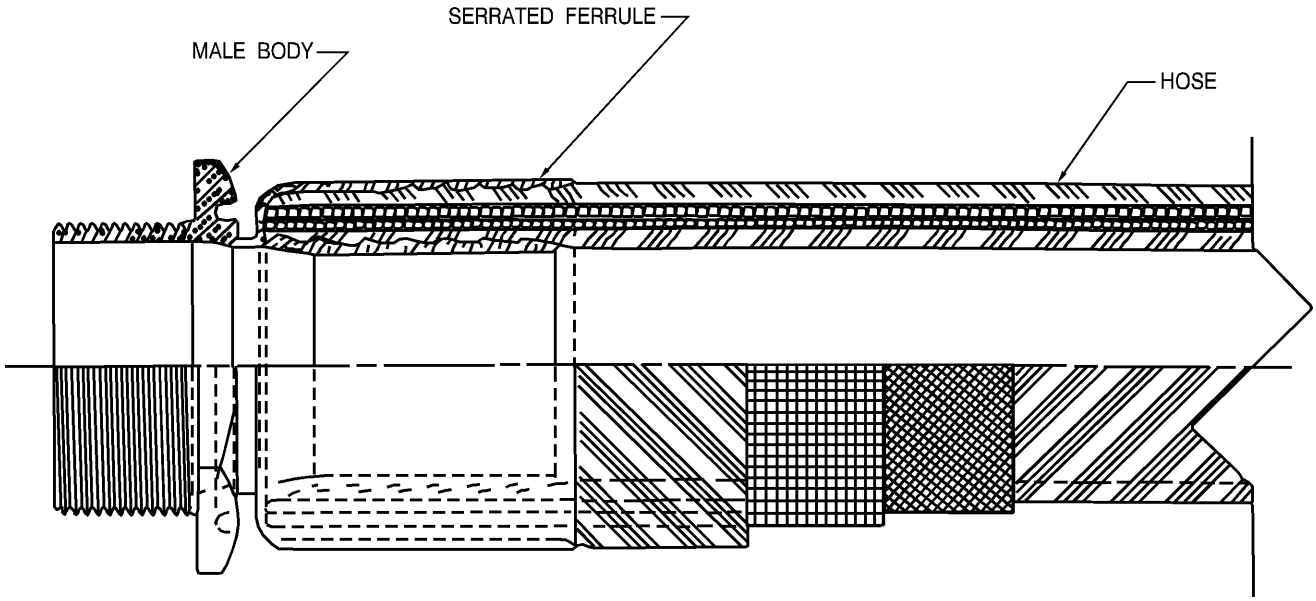
c. Visual inspection of adaptors will be accomplished on a daily basis before attaching nozzles. Monthly inspections will be accomplished and documented on the appropriate Operator's Inspection Guide and Trouble Report using the Gammon SPR Adaptor Test Gauge or like component.

d. Procedures for checking wear of adaptor.

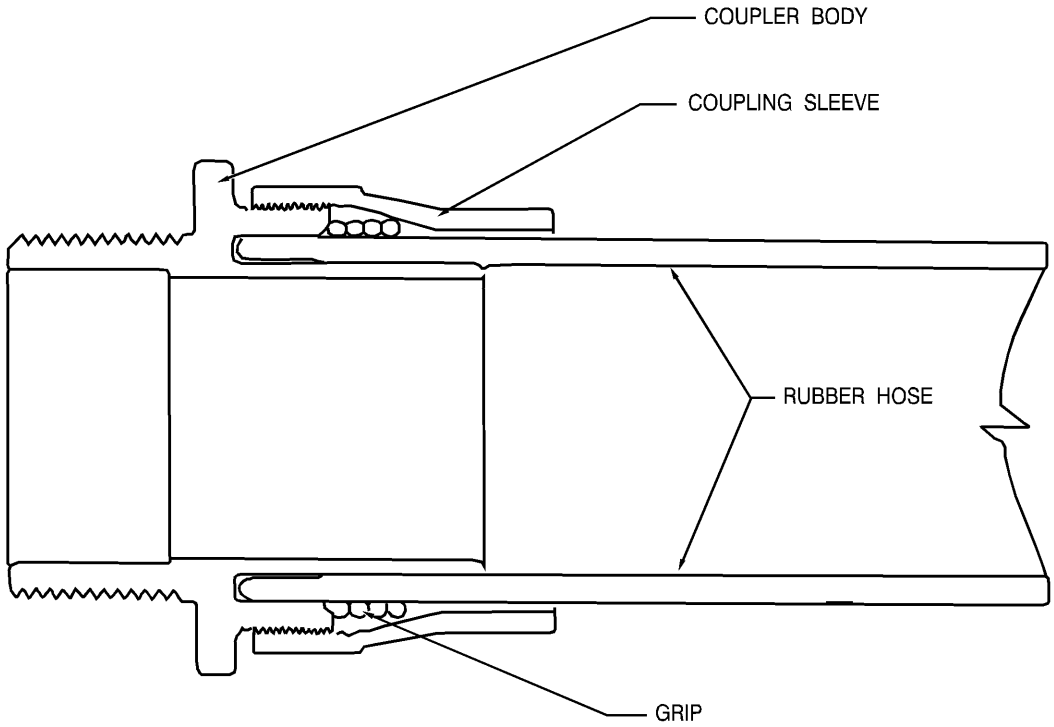
(1) Leakage during transfer of fuel is often caused by excessive wear on the underside of the three lugs. To check for lug wear, set the gauge in the adaptor and rotate it so the gauging pin moves toward the lug. If the pin passes under the lug, wear is excessive and the adaptor must be replaced. Be sure to check all lugs. If any lug is excessively worn the adaptor must be replaced.

(2) Failure of the interlock system can cause a major fuel spill because the nozzle can be removed from the adaptor before the nozzle is fully closed. To check for this wear, invert the gauge and set it on the adaptor with the tongue in a slot. If the small pin completely enters the slot, there is excessive wear. Be sure to check all slots. If any slot is excessively worn the adaptor must be replaced.

(3) Lug width is equally important because excessive wear can result in a spill in the same way as described for slot wear. To check for lug width wear, use the groove in the end of the gauge. If the lug enters the groove, there is excessive wear. Be sure to check all lugs. If any lug is excessively worn the adaptor must be replaced.

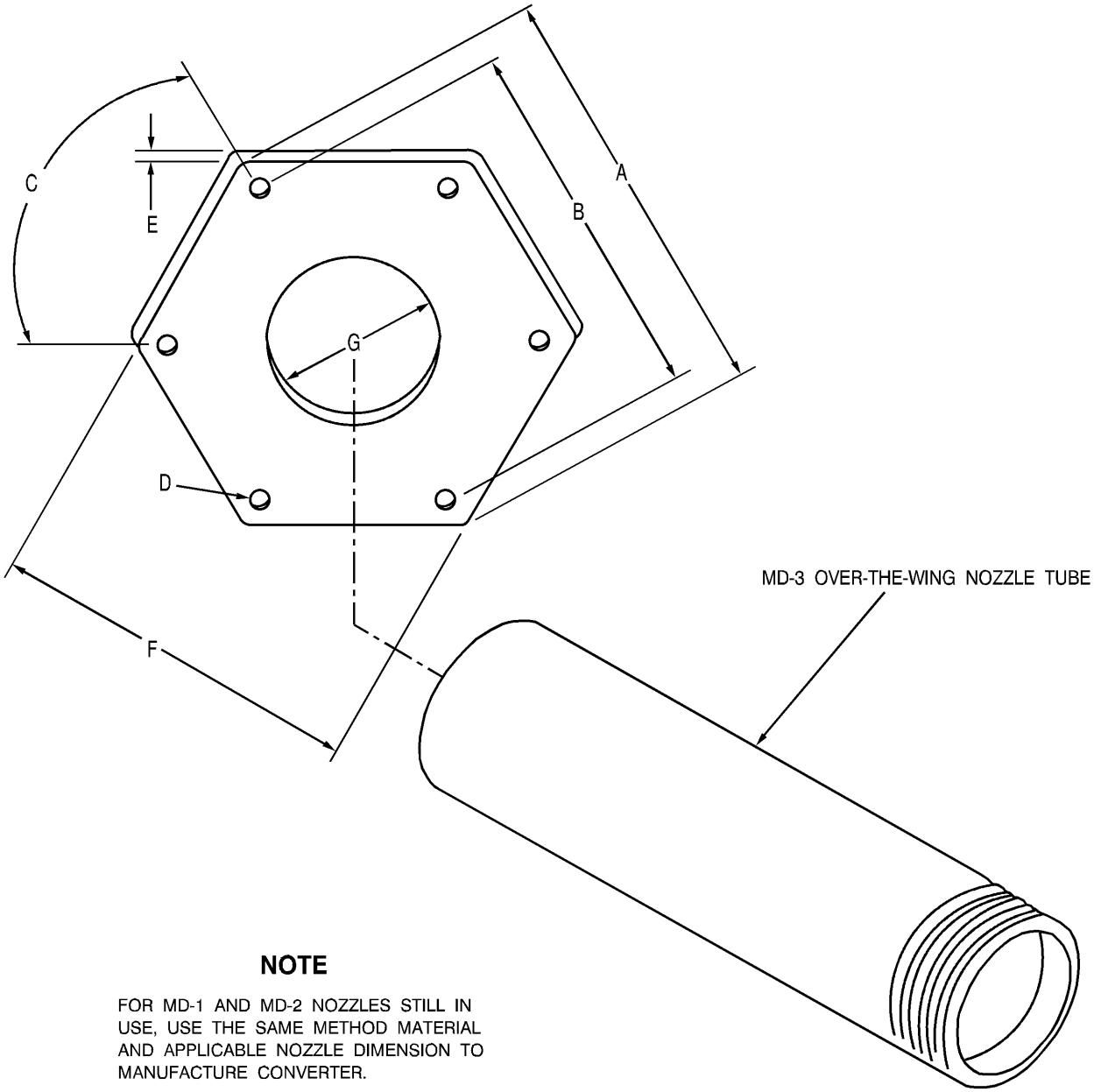


API 1529 TWO-PIECE INTERNALLY EXPANDED COUPLER



SAE AS38404 COUPLER

Figure 4-1. Couplers



NOTE

FOR MD-1 AND MD-2 NOZZLES STILL IN USE, USE THE SAME METHOD MATERIAL AND APPLICABLE NOZZLE DIMENSION TO MANUFACTURE CONVERTER.

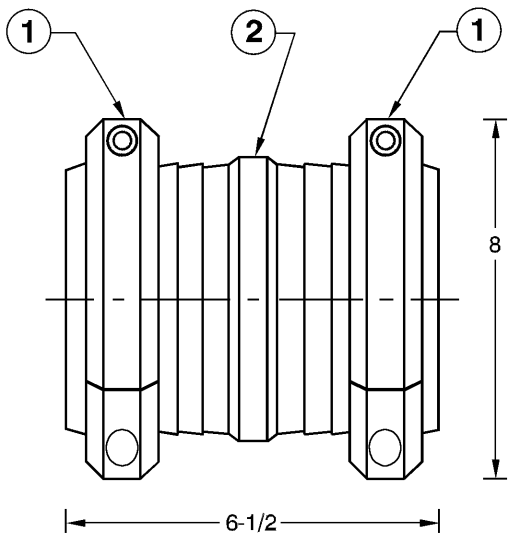
LEGEND

A. Flange Outside Dia 4.500 ± 0.005
B. Bolt Circle 3.812 ± 0.005
C. 60° ± 2°
D. 6 Bolt Holes 0.328 ± 0.010/0.000
E. 5/16 in. Aluminum Alloy Plate
F. Hexagon Dimension 4.000 ± 0.005
G. Hole Diameter 1-7/8 in.

Figure 4-2. MD-3 Over-the-Wing Nozzle Tube

Table 4-2. Ferrule Sizing Chart

Hose Diameter (inch)						
Inside	Outside			Ferrule Size	Ferrule Part No.	Body Part No.
1½	up	to	1-59/64	1.5AAA	24-0295-27-02	24-0295-49-01
	1-60/64	to	2	1.5AA	24-0295-48-02	
	2-1/64	to	2-4/64	1.5A	24-0295-49-02	
	2-5/64	to	2-8/64	1.5B	24-0295-50-02	
	2-9/64	to	2-12/64	1.5C	24-0295-51-02	
	2-13/64	to	2-16/64	1.5D	24-0295-52-02	
	2-17/64	to	2-22/64	1.5E	24-0295-53-02	
	2-23/64	to	2-26/64	1.5F	24-0295-17-02	
	2-27/64	and	up	1.5G	24-0295-16-02	
2	up	to	2-32/64	2AA	24-0296-26-02	24-0296-44-01
	2-33/64	to	2-36/64	2A	24-0296-46-02	
	2-37/64	to	2-40/64	2B	24-0296-47-02	
	2-41/64	to	2-44/64	2C	24-0296-48-02	
	2-45/64	to	2-48/64	2D	24-0296-49-02	
	2-49/64	to	2-52/64	2E	24-0296-20-02	
	2-53/64	and	up	2F	24-0296-09-02	
2½	up	to	2-62/64	2.5AA	24-0312-29-02	24-0312-51-01
	2-63/64	to	3-2/64	2.5A	24-0312-55-02	
	3-3/64	to	3-8/64	2.5B	24-0312-56-02	
	3-9/64	to	3-13/64	2.5C	24-0312-57-02	
	3-14/64	to	3-18/64	2.5D	24-0312-58-02	
	3-19/64	to	3-23/64	2.5E	24-0312-59-02	
	3-24/64	and	up	2.5F	24-0312-60-02	
3	up	to	3-37/64	3AAA	24-0313-44-02	24-0313-42-01
	3-38/64	to	3-42/64	3AA	24-0313-45-02	
	3-43/64	to	3-47/64	3A	24-0313-46-02	
	3-48/64	to	3-52/64	3B	24-0313-47-02	
	3-53/64	to	3-57/64	3C	24-0313-48-02	
	3-58/64	to	3-61/64	3D	24-0313-18-02	
	3-62/64	and	up	3E	24-0313-17-02	
4	up	to	4-37/64	4AAA	24-0913-01-02	24-0913-01-01
	4-38/64	to	4-39/64	4AA	24-0913-02-02	
	4-40/64	to	4-41/64	4A	24-0913-03-02	
	4-42/64	to	4-43/64	4B	24-0913-04-02	
	4-44/64	to	4-45/64	4C	24-0913-05-02	
	4-46/64	to	4-47/64	4D	24-0913-06-02	
	4-48/64	to	4-49/64	4E	24-0913-07-02	
	4-50/64	to	4-51/64	4F	24-0913-08-02	
	4-52/64	to	4-53/64	4G	24-0913-09-02	
	4-54/64	and	up	4H	24-0913-10-02	
Source for above part numbers: Rostra Industrial Couplings 307 Fields Drive Aberdeen, NC 28315 1-800-237-6762						



Index Number	Qty	Part Name
1	2	J-clamp
2	1	J-connector

Figure 4-3. Mender Hose Used on MIL-PRF-370, Type C, 6-Inch Hose